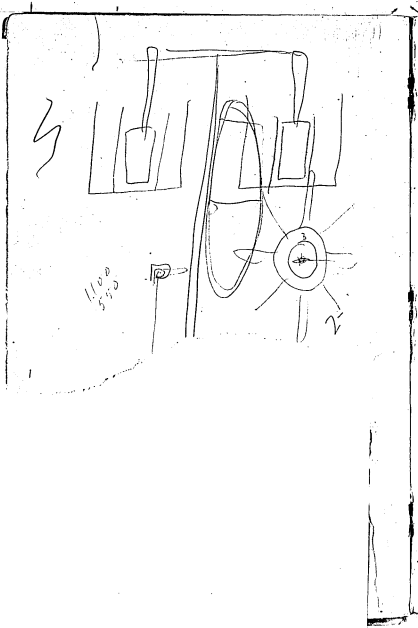
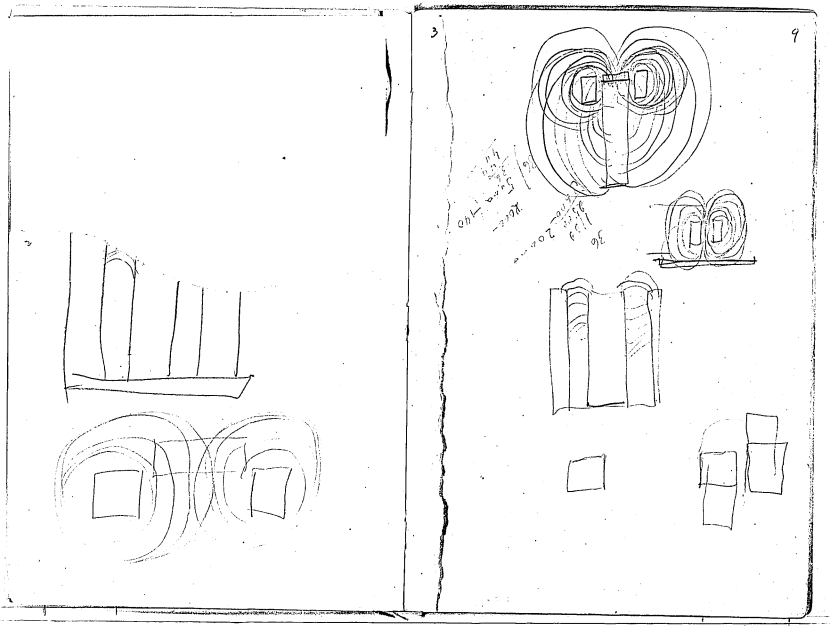
Notebook, N-Undated.35

This undated notebook was used by Edison, probably during the period 1899-1901. It has been used in both directions. Beginning at one end are notes, drawings, and calculations regarding ore milling and storage battery experiments, particularly a copper-zinc cell. At the other end are notes and drawings relating to the use of Edison's ore milling technology in the production of phosphates and phosphoric acid. The book contains 137 numbered pages followed by approximately 20 unnumbered pages. Some pages are blank; pages 3-8 and 13-14 have been removed from the book.

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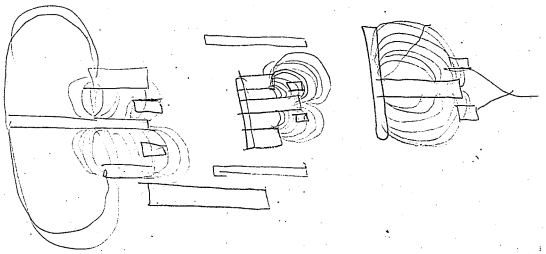


60)8000(133
600
200
140
2

10

1200

120

22)8640(392
66
204
198
60

6 ft-

1

60-
8640-

120-

20

6 per hour-

133)392(3
133-

70 lb
80 lb

80)1728(22
160
128

12

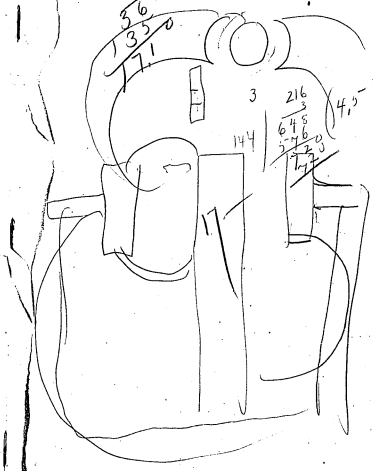
200
50
2240 | 10000 (44
8960
1040
50

4 1/2 tons hour

13

45
36
56
135
71

4 1/2 ft



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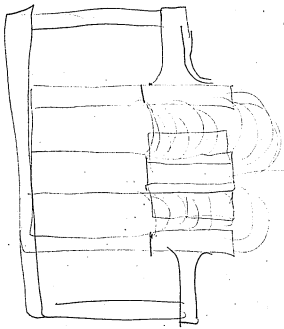
16



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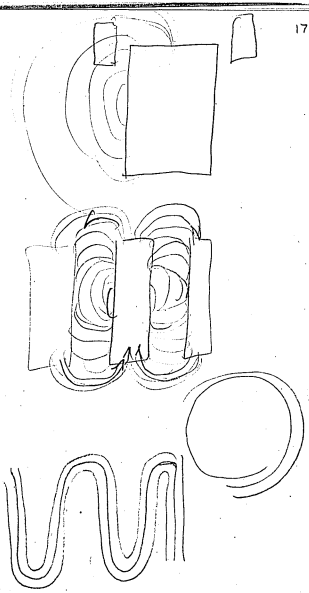
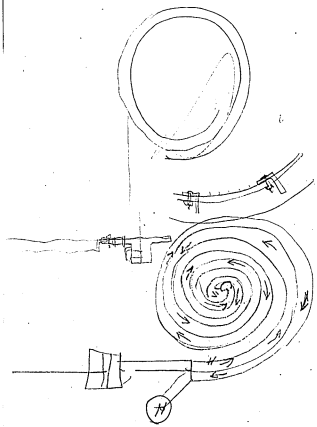
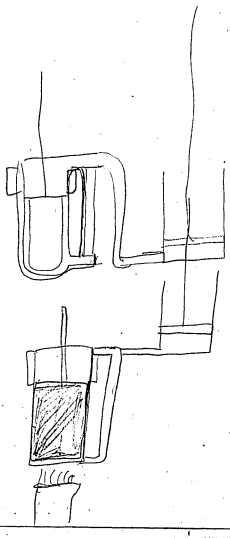
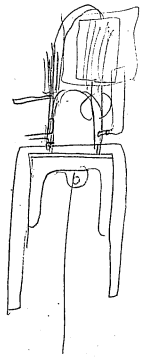
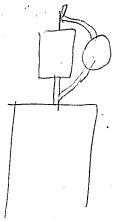










20) 1728 (86 —
160
128

11
13
3 3

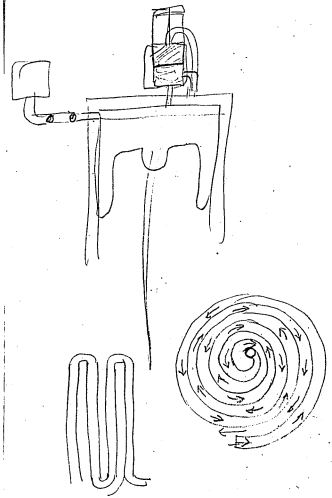
16) 1 1 4 3 - (9
144

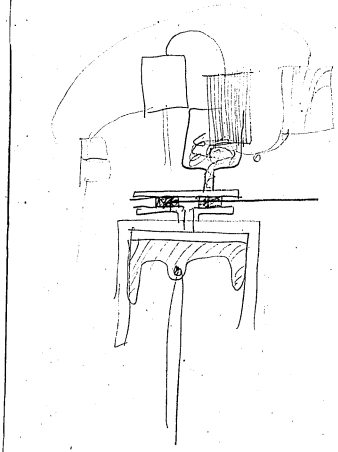
6
4 3.
10 inches

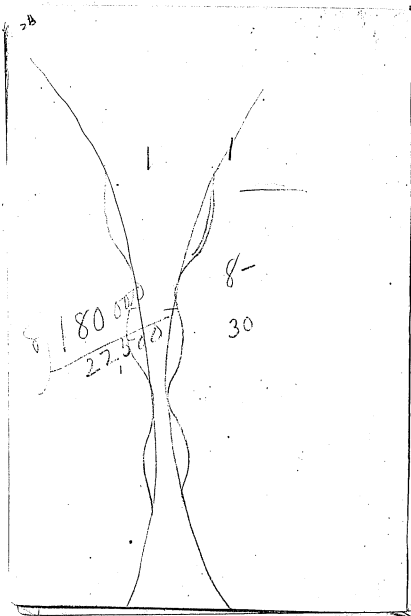
18 Cubic ft.

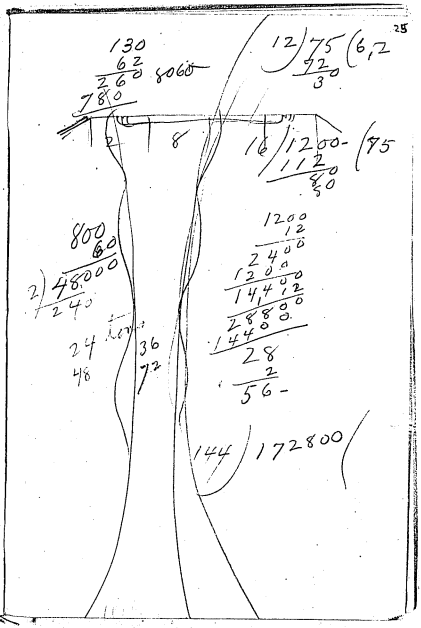
16) 86 (5

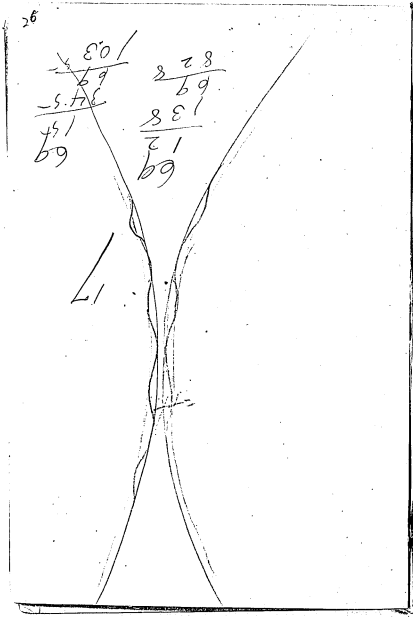
2 3 — 36 3
12 1
150 5

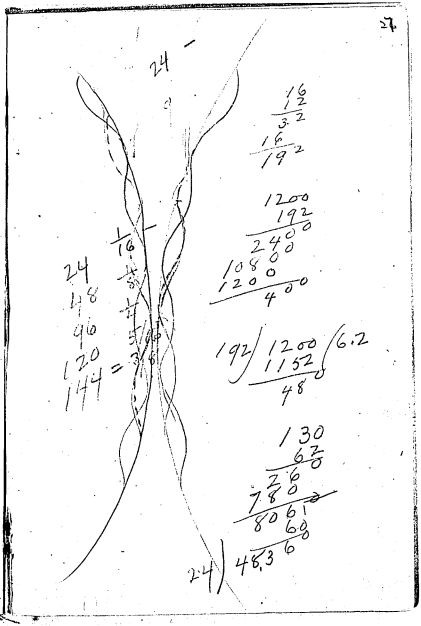





180
22.5
8-
30


130
62
260
780
8060
12)75(6,12
72
30
2
8
16)12000(75
112
80
800
60
2)48000
240
24
48
36
72
12000
12
24000
120
144000
288000
144
28
2
56-
144)172800





28

1728 / 51380 (30

60 —

38

2/6 - 14

24

40

62

3 470

30

9410

165

76

990

915

75

345

14

1380

1345

3303

3450

449

24

96

48

5780

8

4601

1151

345

28

28 Hp —

14100 lbs —

1739

15839 lbs —

600 ft min

1/10 friction —

15

12

30

150

144

10

972

180

2520

2520

3600

10000

6480

5184

1296

1728 / 3.7

470

37

3290

1410

1391

15839 / 600

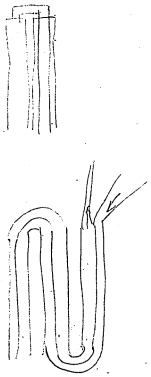
33000 / 9498 0 (26

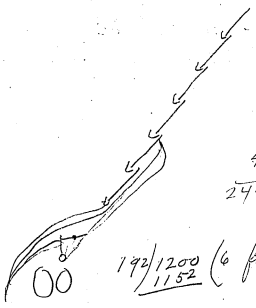
6600 0

2898

10

15 HP friction of Rolls
10 HP ducts pressure 50 lbs



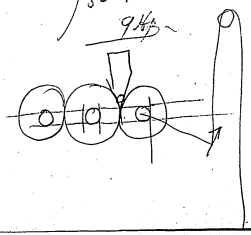


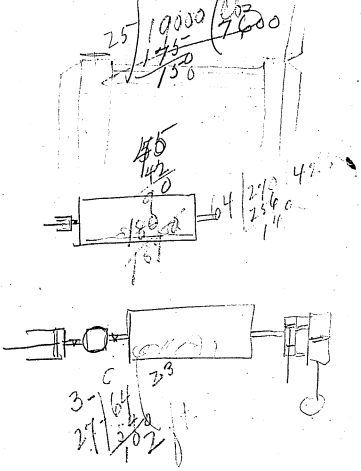
400
600
240,000

192/1200
1152
(6 ft. min

50000
50,000

9 HP





13. 10- 110 / 2000 (18,2
110
900
880
20

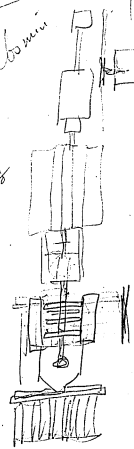
12 / 3140 (261 ft
24
72
60
28
84
1728
182
3456
1382 4
1728
3144 9 $ 31.40
30
14
120
Reg 3 tons
5 - 1 inch

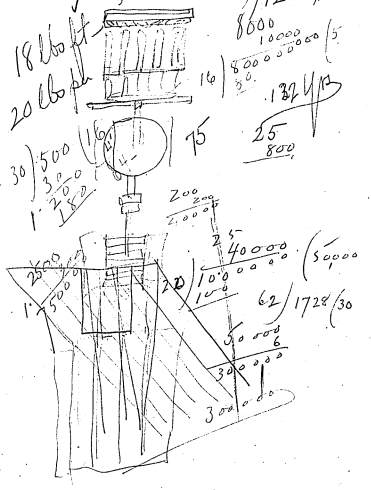
13 / 261 (20
40 1/2
40

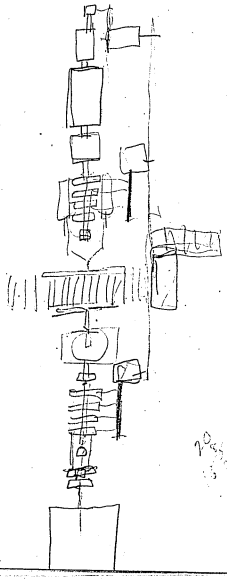
CaO. CO_2 2 5/4
40
16
72
32 44

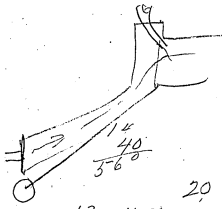
40 Rev 1/2
120 1-

120 1/2









17200 -

40-

3000

40

5-60

20 15

13 - 4000

16

1000 - 140000
32000
172000

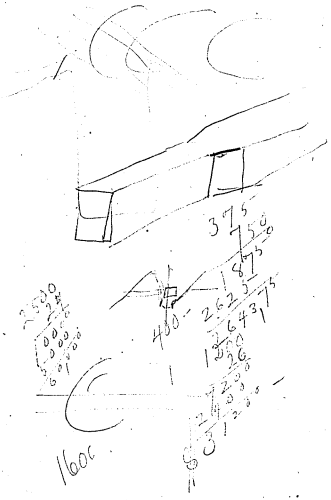
8000 lbs Cluster -

4 / 17200 lbs gas
4300 water

160
2
320
40
80
2
4
10
3/8
3

9 / 4300 -
470

70 4300
800
3 / 3440000
11466.66



475
24) 950 (395
72
236
216
14

10,000 lbs
3,500
166 kips 1/2
166
83
12) 249 (21 Rods
24
9
100 lbs
507
130
150
7 7 7
20,000
20
400,000
600
295
375

14.5 less —

3 lbs hour — 1511 / 145 / 755 / 644 / 111

30 30 90 lbs — 15 / 21 / 09 3

21.909 Heat units to 2 hydrogen 2 —

12) 69 (5.7 / 60 / 9) 21909 (9843 / 1 / 18 / 09 / 4 / 3 / 78 / 72 / 6

1h

3843. Heat units

774

15-372

2691

2690

29744 82

1 lb 2 1.5 H/hours

2 lbs hour — 30 lbs per lb

3 lbs hour

1980000) 2.9744.82 (1.5

1 9 8 0 0 0 0 0

9 9 4 4 8 2 0 0

9 9 0 0 0 0 0

4 4 8 2 0 0

50 lb — 33 0 0 6 0

5 2 0 0 0

15 6 0 0 0 0 30

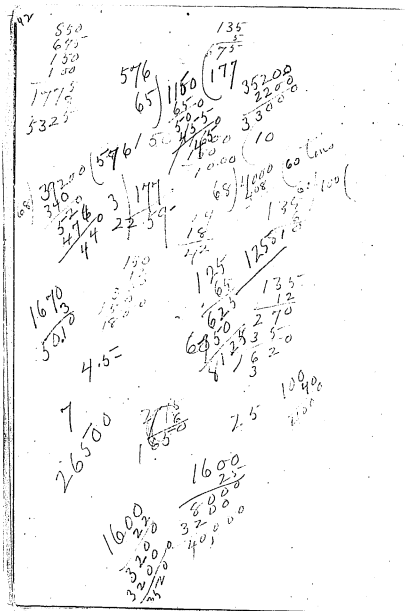
4 6 8 0 0 0 0

1980000) 4 6 8 0 0 0 0 0 (2.3

3 9 6 0 0 0 0 0

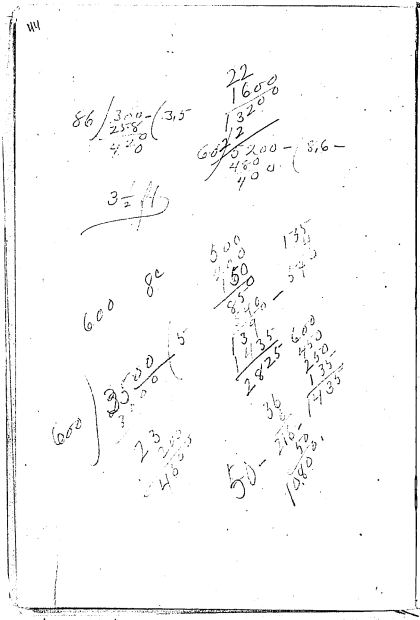
7 2 0 0 0 0 0

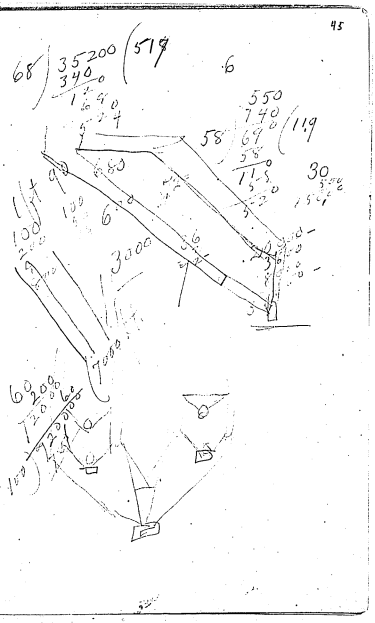
01

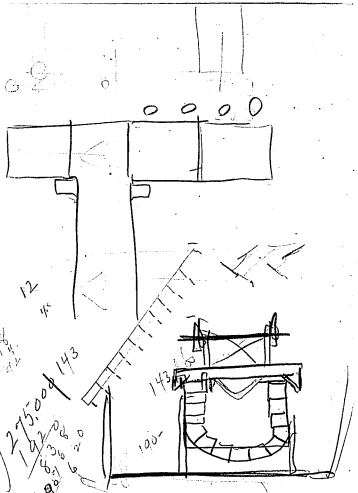


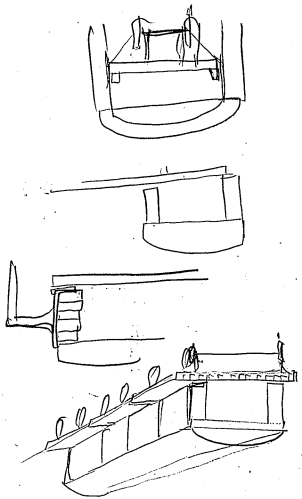
Shovels	5325	
12 mattocks	4200	
2 powder	700	35200
12 blacksmith	900	4000
3 forges	350	39200
1 Surveyor	400	
1 Steward	1000	
Cooks	2000	
Stamper + Cook	810	
6 Helpers	500	
2 Carpenters	1650	
6 Workmen	4000	
Drums	2800	
Coal + oil	3000	
Drill steel	1500	16.58
Repairs etc	26535	

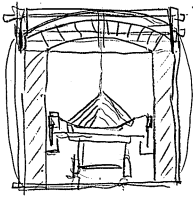
1600 | 26535 | 16.58
1600
10533
9600
9350











12 ton hours

1½ ft.

240
4
6
2

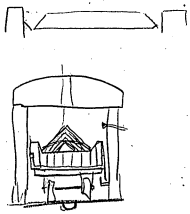
225
6
35
1

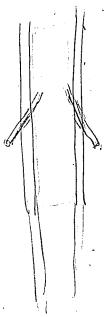
6 ft.

1 100 ft haul

1200'

0
0
0
3
1
0
0
24





180 | 746 (4
720

350

175 200
80
25
200
480

240 | 746 (3,1
720
260
240
200

150
120
300
150
75

750
31
75
750
2325
2325
4500
2325
21,75

50.

58

10 6
60
360 300 : hour

3 000 / 175 / 175 (35 00 (17
175
125 00

30 / 175 (5 8
150
25 00

60 g.

18 / 72 / 1000 (14 / 14 / 200 (14
4 14
72 / 1 5 (5 280
280
200
140
60

72 / 1000 (13
72
280
216
64

30 / 150 (11
30
25

40

48 / 2 / 350
72 175
96 600
336 0
345 / 3456 / 105 00 00 / 30 / 25 / 175 (6
103 68 00
1 32 00

72 / 1000 (

Bricken, 40 100 000
600
24000
50 000

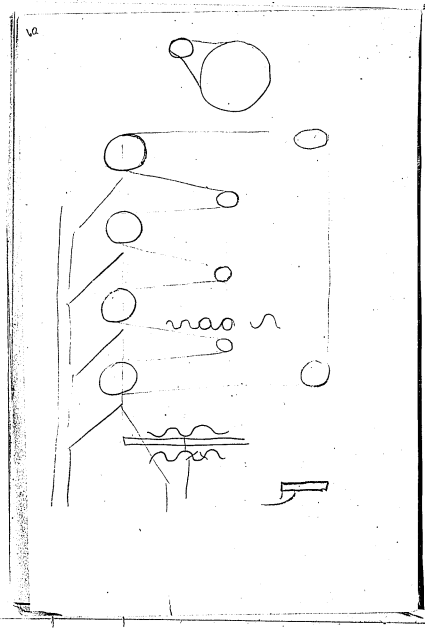
72 / 2000 (28
144
56

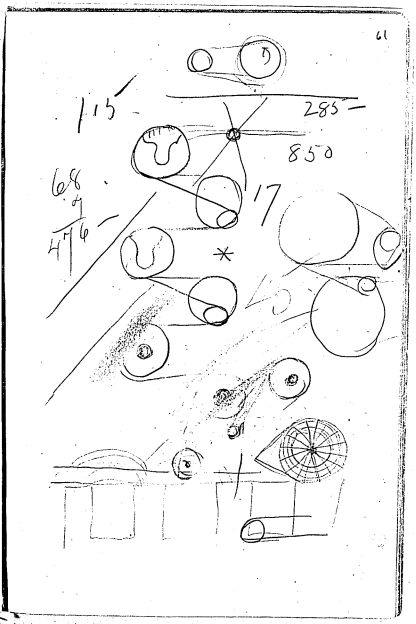
59

10 Hours

grids 3000 per 100 ~~60~~
Hydraulic Lines
per Hp 72 plates. 5 c

4 Cupmatic 30 Hp
2 men - 11 c
perforating 1 man 60 Hp - 3 c
Bricks 1 man 2 mac
2000 grids - 25 HP. 9 c
Putting in 2 grids 1 mac 15 c
Pounding Big grid. 5 c
Plattens, 5
Big Bricks 2 c
Can - 25 c
Bottom ~~25~~ 25 c
Top + Holding 50
Connections - 20.
Assembly 100
Washing 20
glass 20
Separators, 10.
Inspection 40
363




115
285
850
68
17
4 1/6

192) 300 (1.56
192
1080
960
1200

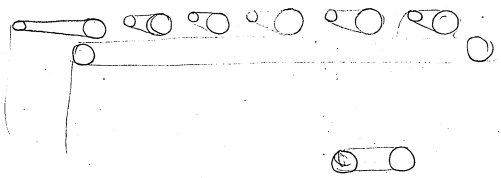
100 ft - 36
1200
7200

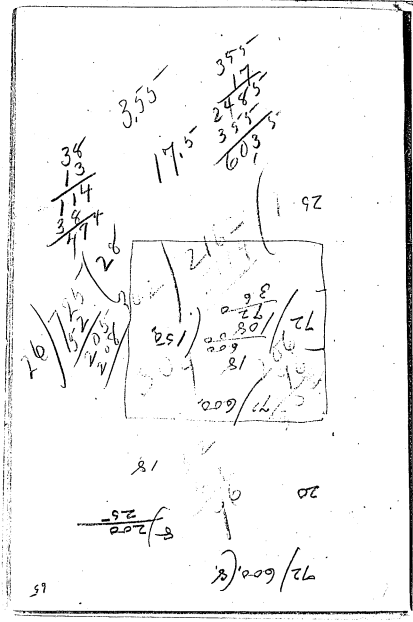
144) 3600 (25
43 2
43

140
150
700
140
21000

ton min -

300 (16
12
32
192





Copper 1357 3712 K

Bismuth

Lead Pb 503 K

Zinc Hg 1511

Tin Sn 2270 14

Pb Sn 2162 K — 7.

Pb Sn KOH Hg 1032 K

Aluminum Hg 1019

Bismuth Hg 1712 9 K

Bismuth Hg 3
177

Ca 6313 g/mol

Pb 207

Zn 65.5

Sn 39

Na 23

Zn 39

per grams

CuO — 6

PbO 2.4

ZnO NaO — 23

KOH — 2.2

Na 44

Na 23

KOH 8.2

39 | 1032 (26) 65.5 | 1.110 (23.5)

23 | 177 (7.7)

207 | 1.214 (2.5)

377 (23) 1019 (7.7)

2 99

$2\frac{1}{2}$ HP per hour

2.5 / 1900 (7.6

175

70 cells

1.8

50

120 70 840

25 70 175

746 / 4200 (5,765 HP

90

60

60 60 60 60

2000 rev / 3600000 (1,8

$2.\frac{1}{2}$ HP Hours – $1\frac{1}{2}$ tons 40 sts ton –

91 – 3 / 35 – 1900 –

175 116 46,6 48

7.6 / 175 (23, amps

30. 50 amps

45 – $3\frac{1}{2}$ Hours

47 4 188

46 Miles

303 | 130

13000 (117

390

600

130

2000

1300

2340

2000

3400

3380

20

2 | 135000

52500

57500

172 | 57500

66

4 | 117

29 25

25

146

29 25

175

1000

8 5

$3.75

12000

8775

3000

2808

5400

5000

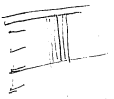
9600

105

1/2 117 Tan

5/8 146

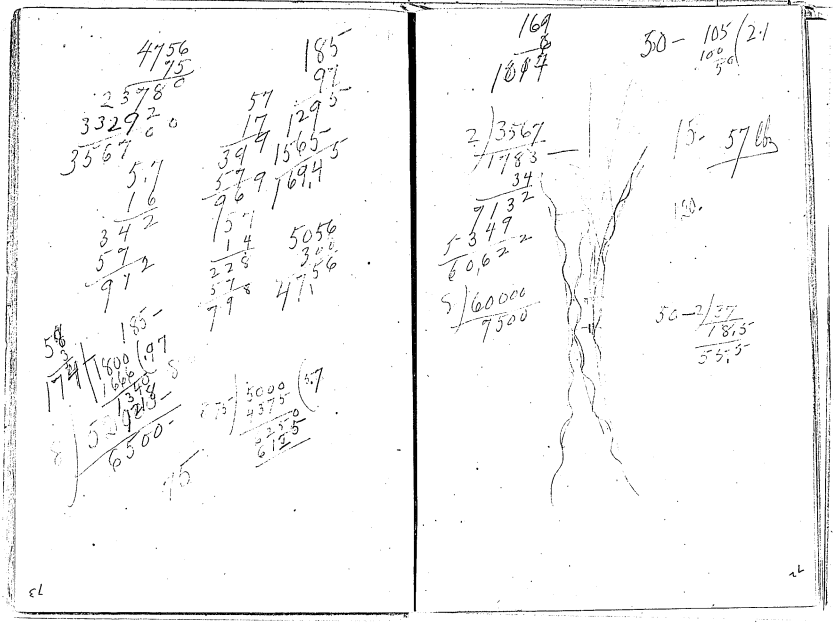
3/4 175

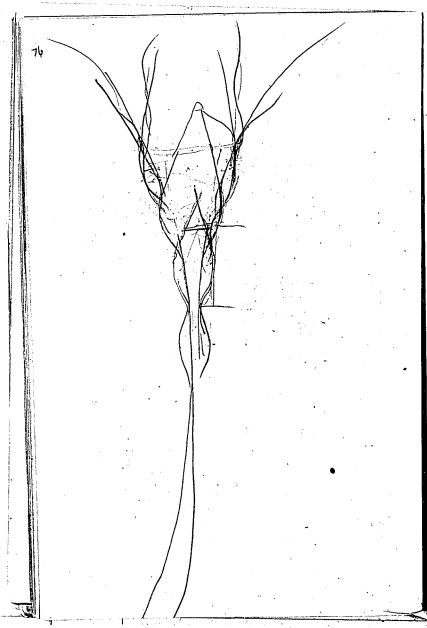


175

12

01

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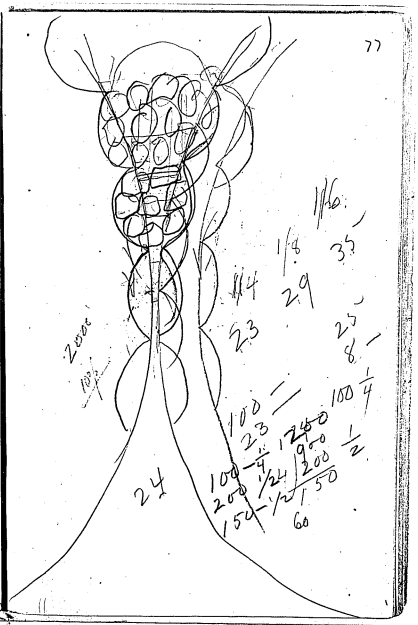
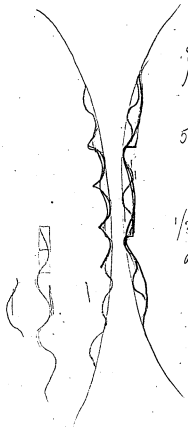
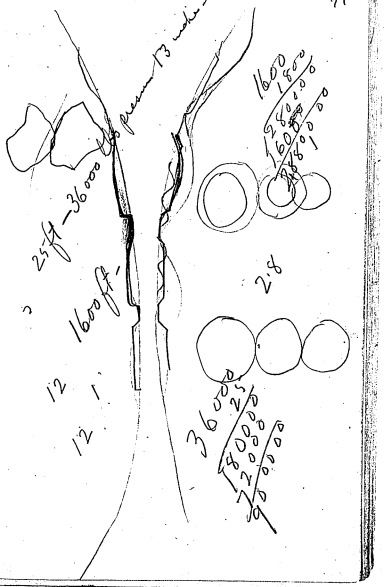
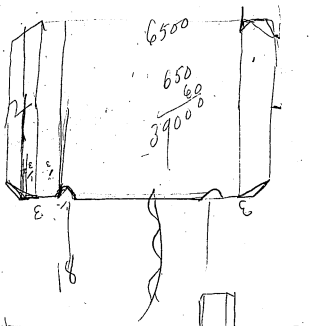
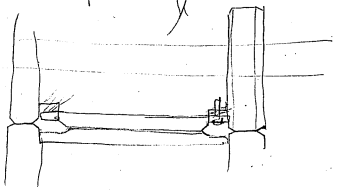
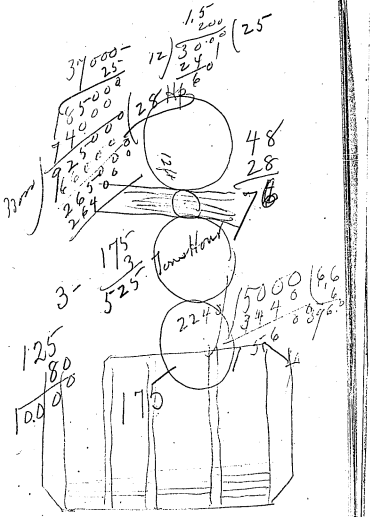

77
1/16
1/8 35
1/4 29
23
25
8
100
100 1/4
23
1/2
24
60

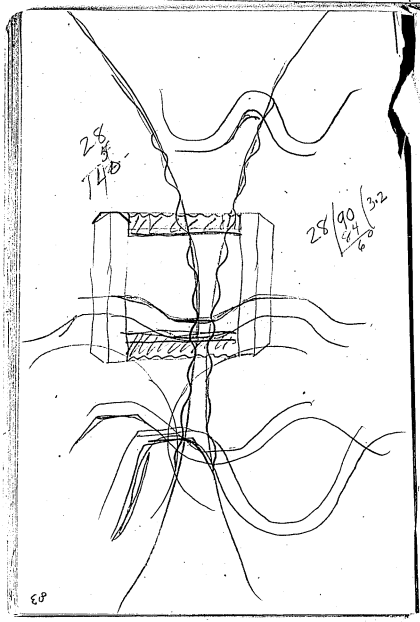

2 @
8/16
2 4
5/16 — 53 —
1/2 abrasive
double jet

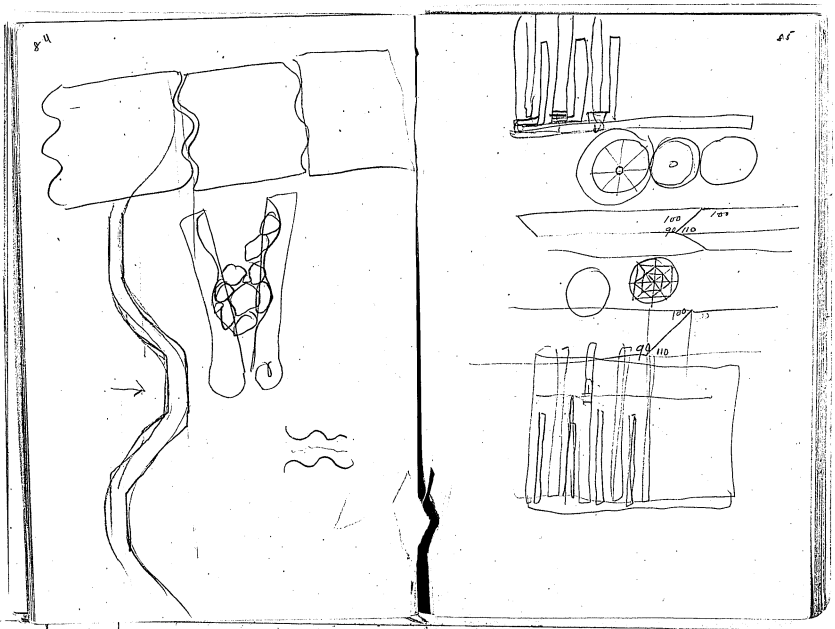

25ft — 36000
1600ft
12
12
36000
2 @

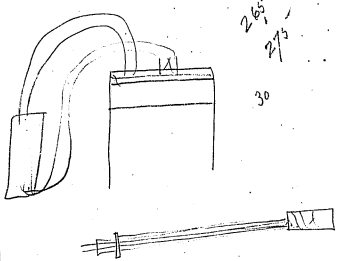

6500
650
3900

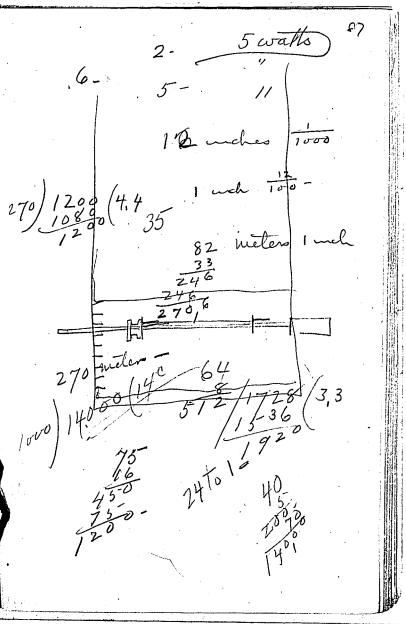



1.5
200
12
25
48
28
175
3
525
Hour Hour
125
800
1000
1750




88
45
D
100
90
110
100
90
110



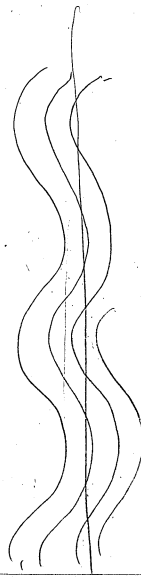

5 watts
82 meters 1 inch
1 inch
35
meter
64
3,3

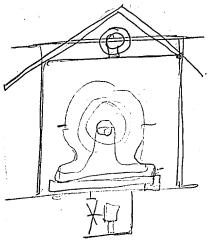
160. 160) 2240000 (14000
160
640
640
0

28000 — 36 lbs —
10000 36) 400 (11 tins per lbs
6 160 36 4 11) 160 (14c
200 11
500 5
500

7# grains — 1 lb.
400) 36000 (90
3600
0

2240 (36
29 16
174 464) 15682 (33 lbs
139 4 1392
36 2784
2784
0



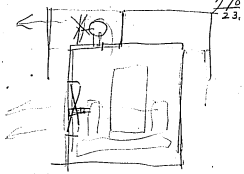


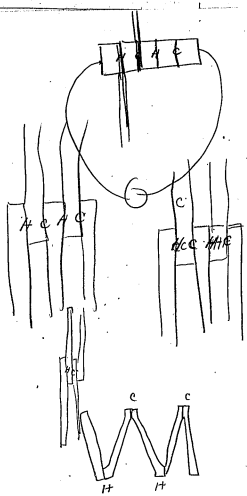
1/15

15
1/10.5

7 1/10 ohm

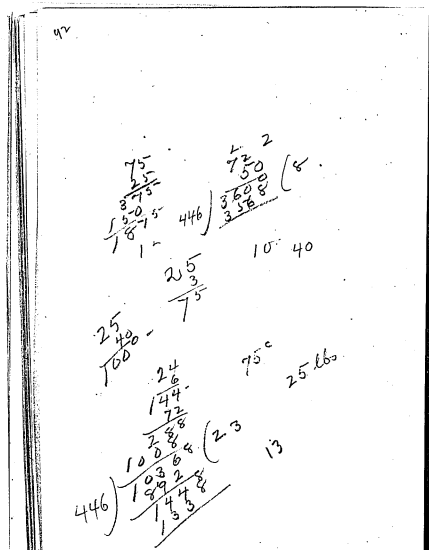
1 Val 70/100 amp
.5 35/100
3 3/70
23.





1b

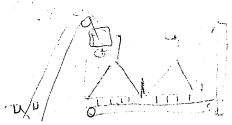
a10



36	363
Tool makers.	100
general -	75
Coal + supplies -	50
25 lbs Chem 75c	1875
Pocket steel	320
glass	300
25 lbs grid steel 10c	250
Nickel for plating	60
Cinnabar chloride,	50
Asbestos &c	75
testing.	25
	3543
	1875
	1668

3543
800
27.43

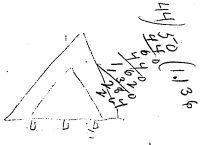
120
120

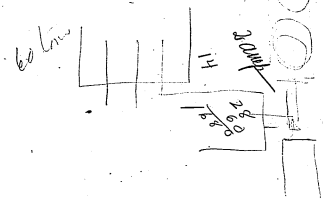


20-

30	1	30
40	2	80
60	1	60
45	3	135
62	2	124
40	1	40
		467

467



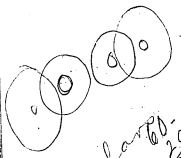


98

10 000
16 000
2 000
10 000
8 000
3 000
2 000
12 000
8 000
15 000

130 000
86 000
65 000
30 000
75 000
25 000
30 000
25 000
15 000
20 000

3
1500 50
150



250
216
34

Scholarship 60 30 120 3600

1 day 30 hr 15
2 .5

99

7800

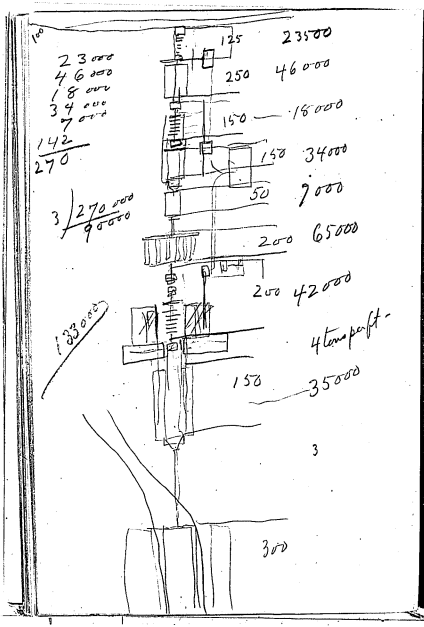
5
20 172 800
12
8 1376
3
4
20

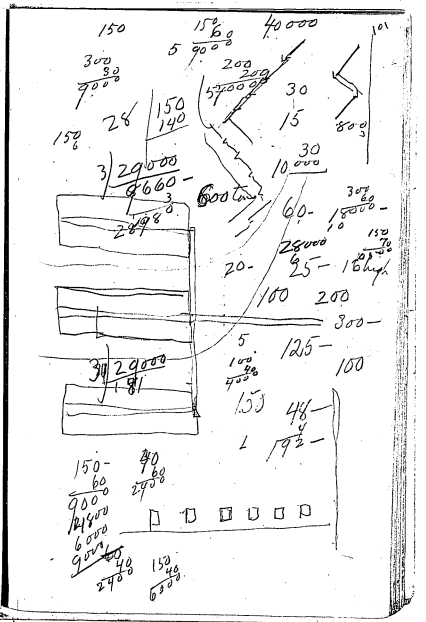
13600
2
3 30 000

40
20
20
10
6
5
01

10 6 Oct. 1

100 = 2600 3 8 00


23 000
46 000
18 000
34 000
7 000
142
270
3 270 000
90 000
125
250
150
150
50
200
200
4 times perf.
150
300
23500
46 000
18 000
34000
7 000
65000
42000
35000
3


150
5
40 000
300
200
57 000
30
15
150
28
150
140
3 29 000
6660
10 000
60
25
100
200
300
5
125
100
3 29000
155
48
150
60
900
6000
90
40
150
40
60

500 668 ...

48 mph

100

$\frac{1}{2}$

300
5000
1300.000

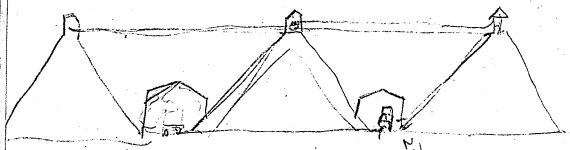
400 | 207360 | 518
2000
736
400
3360

2 | 5184
25920
20736

72
2
144
504
5184

55
18
440
55
990

72



1

Lead – $PbO + H_2SO_4 =$ Lead PbO

Lead ——— PbO_2

All insoluable – oxidin of lead
deoxof PbO_2 to PbO —
PbO_2 Conductor

Copper O – Caustic Soda Zinc
oxide Zinc – dissolves but
Oxide Copper –

Jominka Cu Zn battery
defect – The Zn O should
not be soluable in the
liquid nor the CuO or Cu
or Zn —

probably the Copper & Zinc
should both have holes filled
with ~~Cyanide~~ Cyanide of Cu & Cy Zn

Clothes Exhausted both were
brass ~~Cyanide~~ Cyanide & ZnCy
with no Current

by charging ZnCy reduced
to Zn while CuCy raised
to Copper Cyanide – They may work
in both alkalum + acid Solution

also ferrocyanides a cure way

501

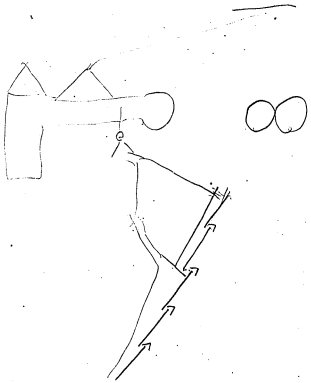
101

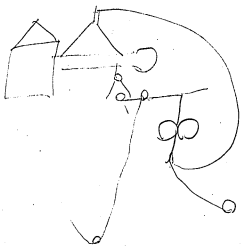
Alkalis

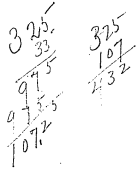
Copper	Slightly Soluable
Aluminum	Very Soluable
Bismuth	Insoluable
Boron	Soluable
Antimony	Soluable
Arsenic	Soluable
Barium	Soluable
Beryllium	Soluable
Cadmium	Insoluable
Calcium	Soluable
Cerium	Insoluable
Chromium	Soluable
Cobalt	Slightly y at all Soluable
Didymium	Insoluable
Erbium	probably Insoluable
Gallium	Soluable
Germanium	Soluable
Gold	Soluable
Indium	Soluable

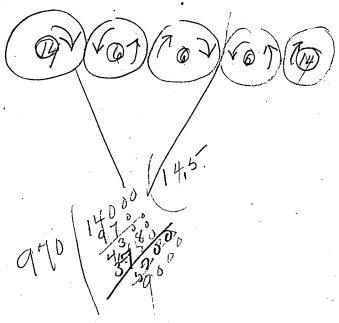
Iridium Soluable
Iron Soluable
Lanthanum Insoluable
Lead Soluable
Lithium Soluable
Magnesium Insoluable
Manganese Soluable
Mercury Slightly Soluable
Molybdenum Soluable
Nickel Insoluable
Niobium Soluable
Osmium Soluable
Palladium Slightly Soluable
Phosphor Soluable
Platinum Somewhat Soluable
Rhodium Soluable
Rubidium Soluable
Ruthenium Soluable
Samarium

Scandium
Selenium Soluable
Silicon Soluable
Silver Slightly Sol
Strontium Soluable
Sulphur Soluable
Tantalum Soluable
Thallium Soluable
Thorium Insoluable
Thulium
Tin Soluable
Titanium Soluable
Tungsten Soluable
Uranium Soluable
Vanadium Soluable
Ytterbium
Yttrium Insoluable
Zinc Soluable
Zirconium Soluable









115

1650
300
900
325
250
500
500
600
500
5-0125

1200

1600
300
300
700
7-00

5c
3
4
6
4
6
2
10
5

45

350

2

1200
45
6000
800
756

2

4000

56000 (14c
40
160
160

2c
4
8
12
24

500
1000
2000
c 25

5 / 12

2-1/2 c

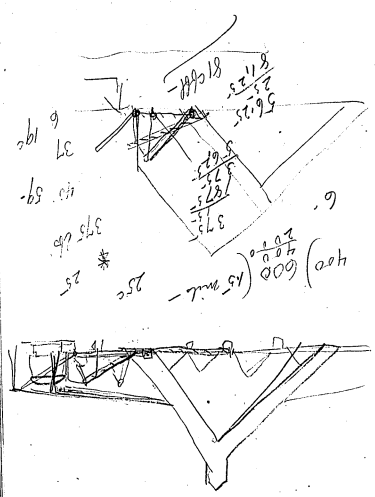
125
4
500

16) 2240 (14
16
64

25 2000
125
750

5000

111



150 − 8

24

600

300

3600

33000) 3300000

109

25

545

2180

2725

2500 (12

500

400

100

5 | 360 | 72 | 36 | 708 −

12 | 120 − 250 − 1

3 | 120

360

200

33000) 2000000 (72

1200

2000

2400000

3300000

120

140

Na_2CO_3

22

100 lbs soda ash
100 lime 190 ft free
lbs

S 32 atomic wt

3 times the wt of CO_2
to make 13 off

3
14.66

In 100 lbs of $CaCO_3$
14.66 lbs air required
13
439
1466
190.54

936–

40 Ca
16 O
56

12 C
32 O_2
44 — wt

14
4
56
16
72
13
2.16
72
93.6

$CaO(CO_2)$

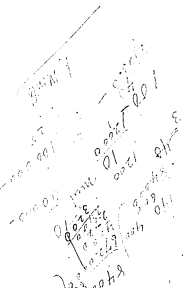
H_2SO_4

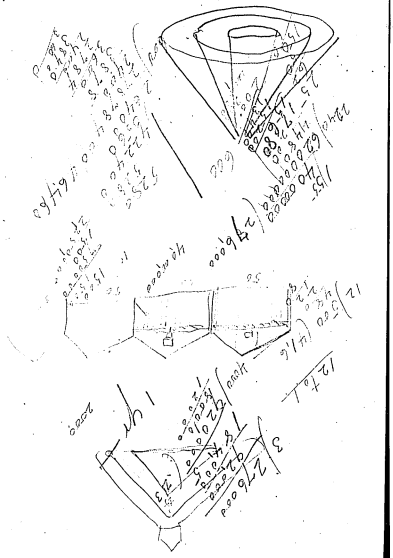
6–
1200
8
96
12
Ca
54

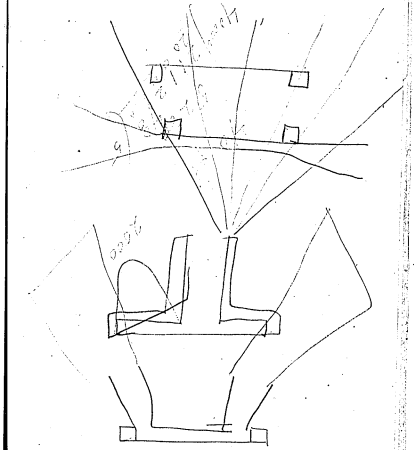
$CaSO_4$ H_2O CO_2

32 66–

811







24000 6
80 feet 1 foot (120000
1800
1920

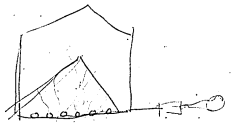
24000 cft –

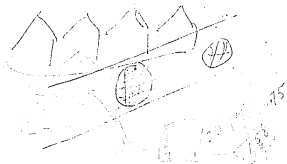
1 feet wide –

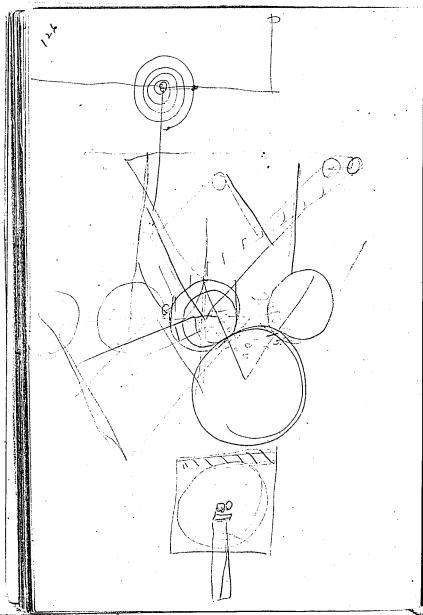
120000

100 –
500
50000

200 × 500 –



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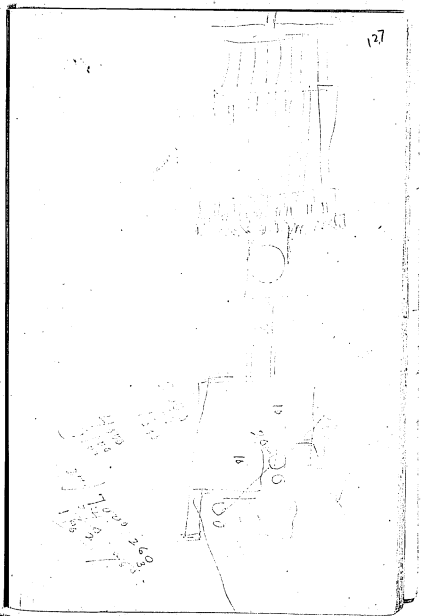
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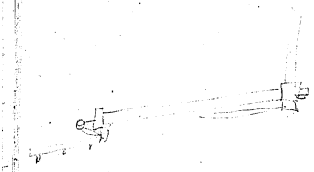
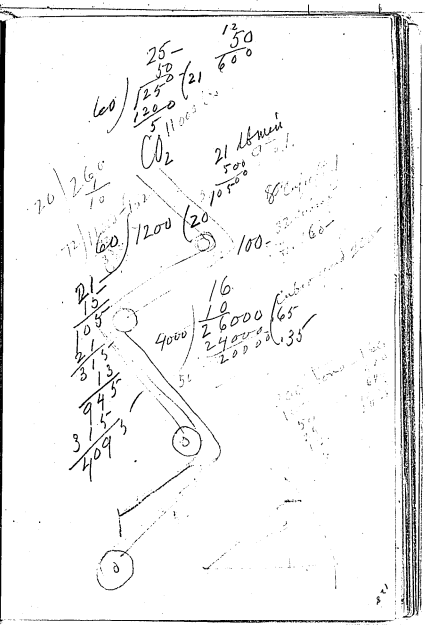
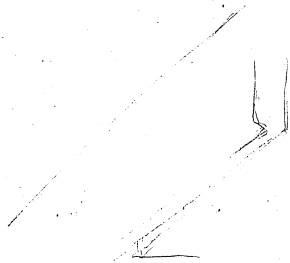
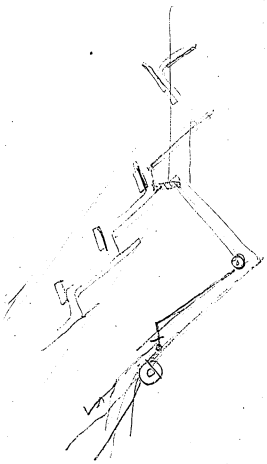
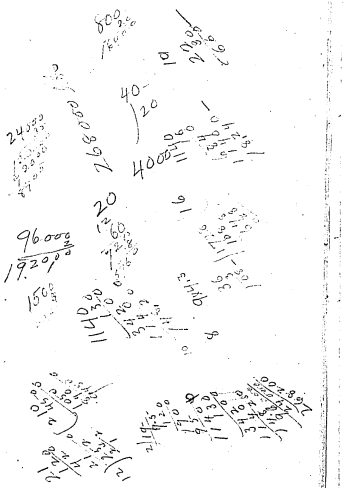


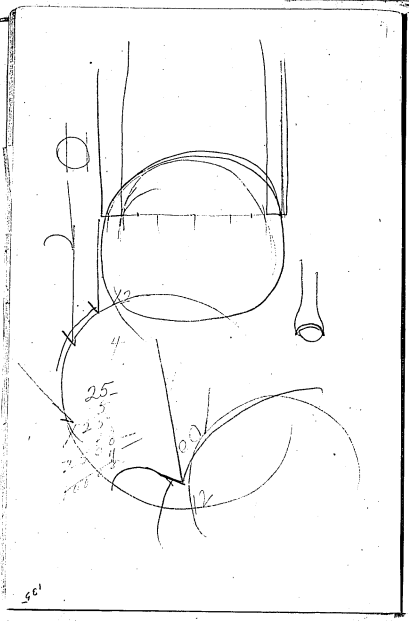

25
600
21
1200
CO_2
21 Liquid
1200
20
100
4000
16
26000
65
35

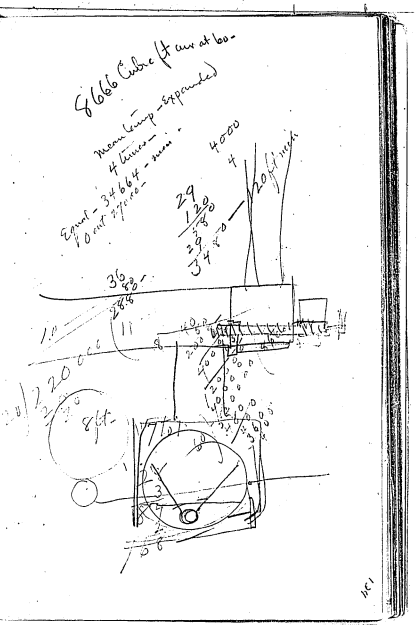




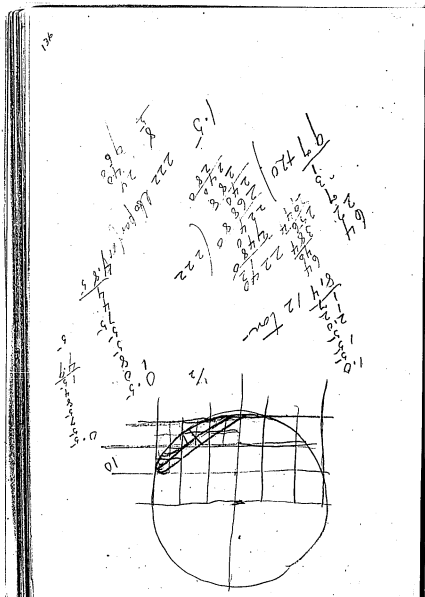
22 roofing & at $30 — $660
96000 lbs cyp. shingles 2c — 1920
24000 lbs white shingles 3½c — 840
Shutters, framing & sashes:
[illegible] — 400
Paint, oil & putty — 350
120
Nails
Screws, [illegible] hinges, brackets
75 200 120 — 395
Hammers, Regenda chisels
150 350 — 500
Blowers & Conveyors & saws
75 50 — 125
5310






4666 Cubic ft air at 60-
Mean temp - Expanded
4 times -
Equal - 3 to 6 ft - area -
40 cut 3 times - area -
4000
4
20 ft/min
29
1 20
38
39
34
36
8 ft -

136



137

20 mm / 7 200 000 000 / 3600

20 / 3600 / 130
20
60
60
0

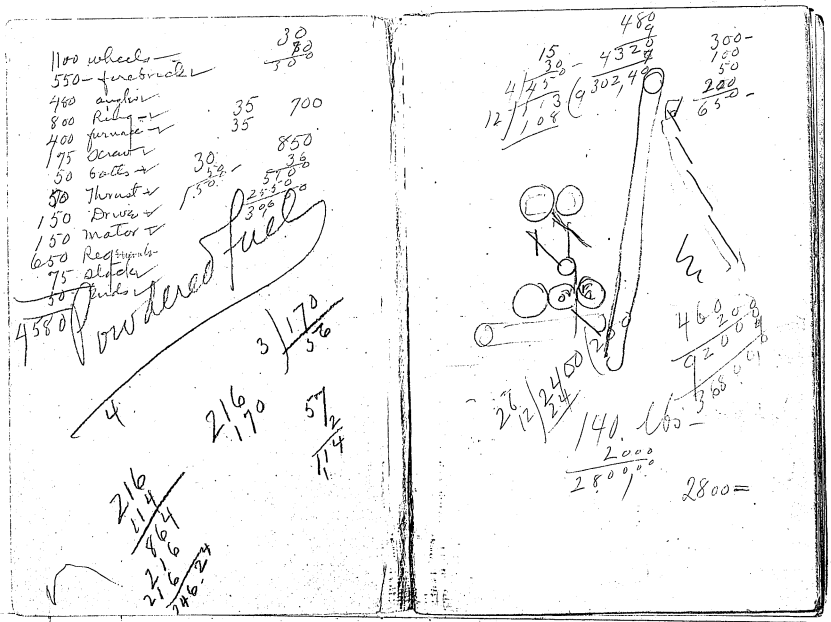
1980000
20
39,600,000

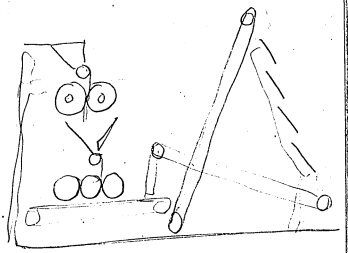
180 mm 2 mm N
360000000 20
720000000 39 mm

7200000000 / 3900000000 / 1846
3300000000
3120000000
180

185 NR

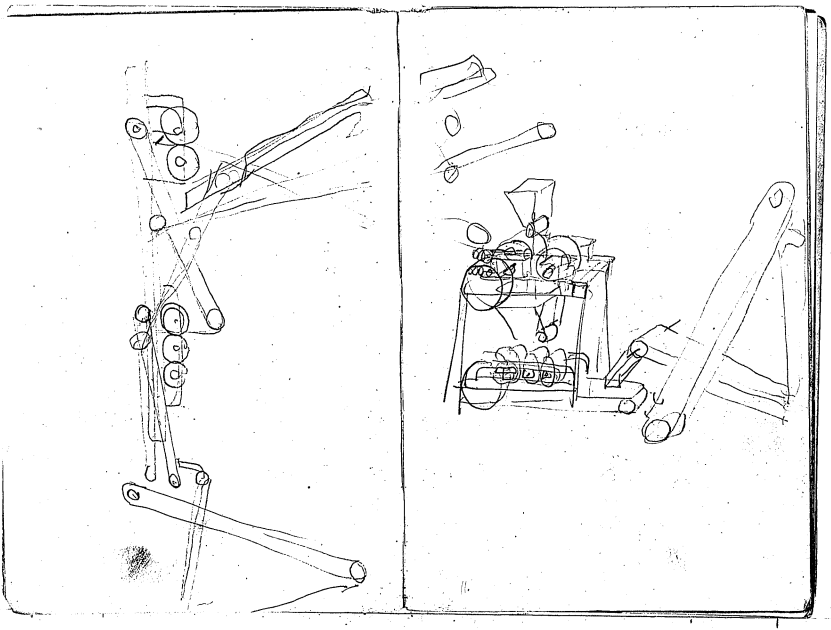
[THIS BOOK WAS USED IN BOTH DIRECTIONS. THE FOLLOWING PAGES WERE FILMED FROM THE BACK END FORWARD.]

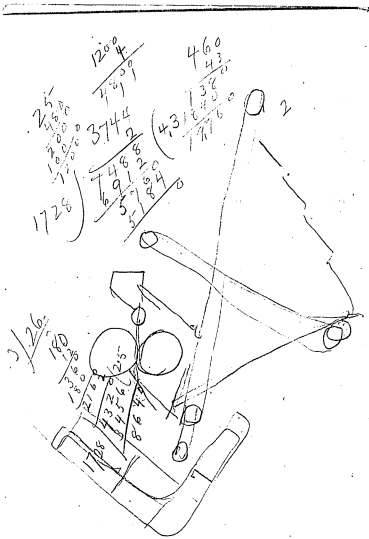


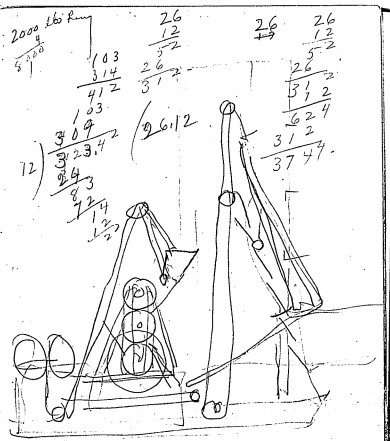


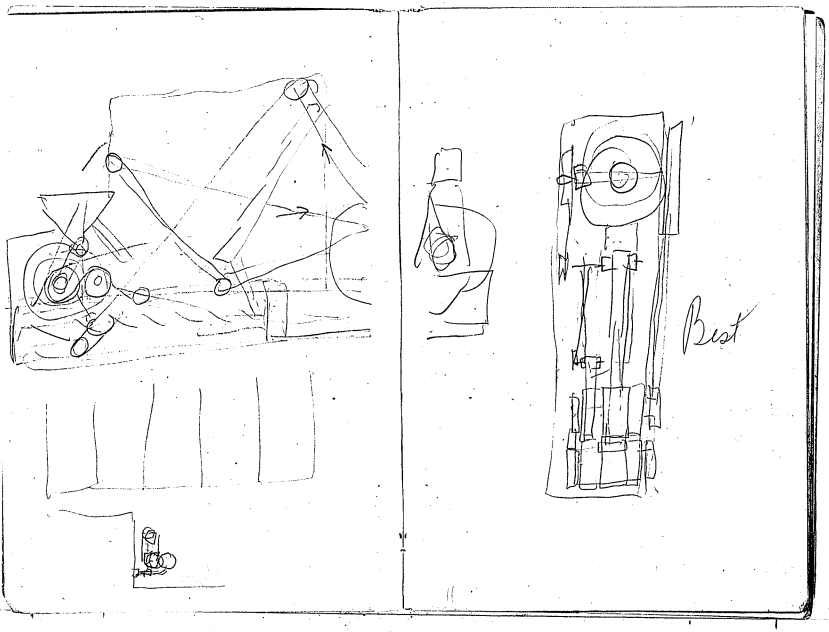
39
5
195

39
20
780
195
3900








Best

12 50 / 600 — 32 50 / 160

50 lbs C — 600 atoms
Require — ~~1600~~ 1600 " 160 lbs O
100 $KClO_3$ 47 lbs O 340 " $KClO_3$

$KClO_3$
23 35 48
39 96

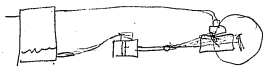
33 — 66 lbs

48 / 1600 (33.
144 0
1 64
1 44

47 lbs

500 / 1600 (3.2
1500
100
100

50
32
100
150
100
0



1725 / 7600 (4.4
6900
700

44
264

43 ft =

16 / 12.8
2 5 6
3 2 0
2 5 6
0

2600 ft/min

160 — 12

47 / 160 (3.4
141
190
188

5 X 5 — 300 min —

50
20
100

13000 Cft/min

5.

43 —

PbO_2

340 lbs 200 — 16 —

30 6 0

100

33
8

5 / 3000
60 / 2600 (43
240
200
180

450
25
225
200
250

$NaNO_3$ — $\frac{1}{3}$ rd

30
14
48

15 lbs pulls –

60 / 750000 (12500 ft
120
300
300

12500 per minute –

60 / 26000 (433
240
200
180
20

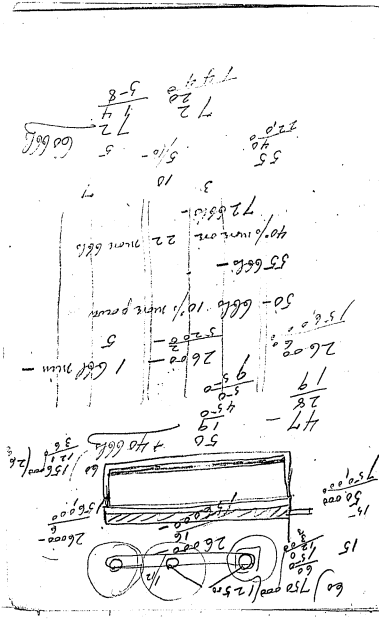
1 1/4

1" 433 / 12500 (29 – cells
866
3847
3897

I have been studying the phosphate question and I have reached the conclusion that the scheme to obtain big results is as follows —

1st Organize a Concentrating Co make Contracts with the best Companies in Florida region — for supply of rock & for eventual Control of the Co thereafter —

2nd Erect one or more large plants for producing Sulphuric acid for producing & manipulating the Rock & the production of Syrupy phosphoric acid



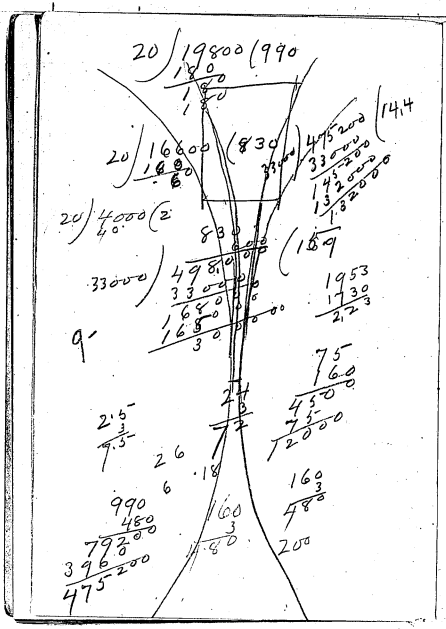
and to Establish in
England - France & Germany
to which the acid can be
shipped in tank steamers
from tide water on the gulf
& there worked up into
Superphosphates, ~~Nitrates~~
near points where used -

Cotton Thrips to Mediterranean
could bring Sulphur to Tampa
Cheaply as Ballast, and
We could own our own
Tank Steamers,

We could work low grade phosphate rock that now will not bear cost of transportation —

We would then break down the German phosphate Combination & be in a position to Control the thing generally —

There are a number of Industrial Chemists who understand the business thoroughly + could report on the practicability



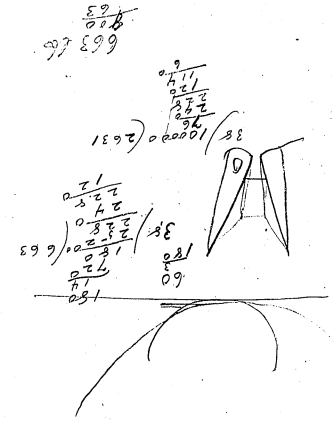
24 Roll — 16600 lbs
30 " 19800

24" 200 Rev minute 600 ft shaft speed
$\frac{1}{20}$th Coeff + 830 lbs -
498000 ft lbs 15.9 Hp
3 63 per rope pull
1200 ft surface belt
Total 1953 Hp

30" Roll 160 Rev 480 ft shaft speed
$\frac{1}{20}$ Coff 990 lbs —
475200 ft lbs 14.4 Hp
2 00
Total 17.3

or 2 Hp in favor of big roller

36 inch shell
same power as 30
about



Our machinery will grind ten times more phosphate rock ~~from~~ ~~the~~ than ~~the~~ same money than anything now used but ~~phosphates~~ of more importance we can grind very much finer than it is possible with present machinery thus making a greater saving in regard to the quantity of acid used upon the Rock

"There is very little doubt but that the Florida deposits are the most valuable ~~of~~ greatest known, but with present system ~~of~~ The German Combination their owners will never reap the benefits they should without they ~~have~~ are Turned into a large affair ~~of~~ the Methods are changed in the manner of house indicated —

24" shell wt 1431 lbs
30 " " 2513 lbs

pulley shaft + outside shafts
2900 lbs each
middle shaft 1900 lbs

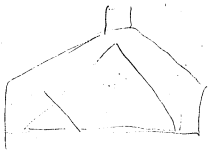
wt of all sheaves 2630 lbs
wt pulley 1400 lbs –
other weights – 600 lbs

Total weight 24" Roll –

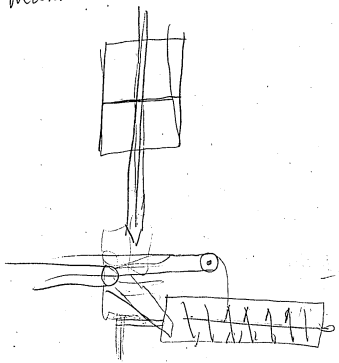
wt 30 Roll –	
7539	4290
7700	7700
2630	2630
1400	1400
600	600
19869	16620
	4290
	12330 lb

Algonkin
Bannock
Modocs
Shoshone
Sioux ✓
Zuni
Flathead
Blackfoot ✓
Shawnee
Pawnee ✓
Massasogua
Hurons ✓
Oneidas
Senecas ✓
Tuscarora ✓
Delewares
Wampanoags
Leni Lenapes
Miensi
Seminole ✓
Chactaw ✓

Mohawk
Iroquois ✓
Onadagia
Mohawks ✓
Mohican ✓
Wyomings ✓
Chickasaw
Creek
Comanche
Apache
Dakotas ✓
Utes
Piutes
Brules
Chinook
Osage
Ogallah
Kiowas
Obijaways

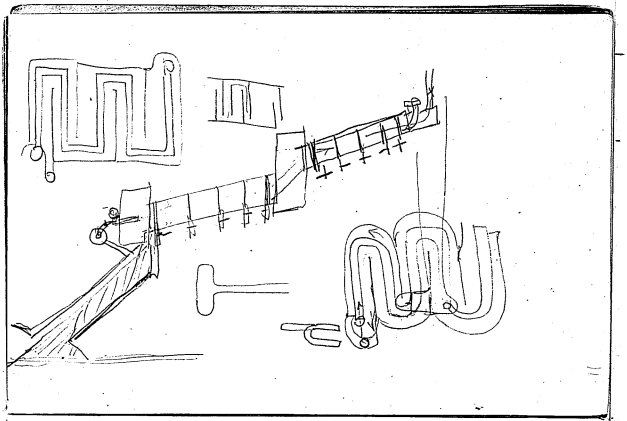


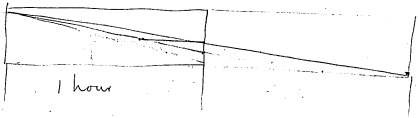
Ottawas
Potawattamie
Pequod
Manhattan,

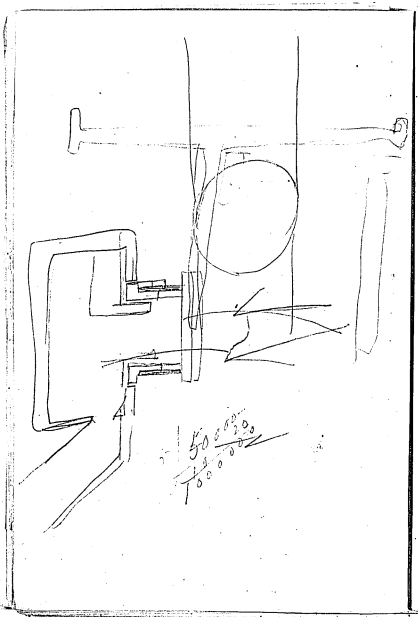


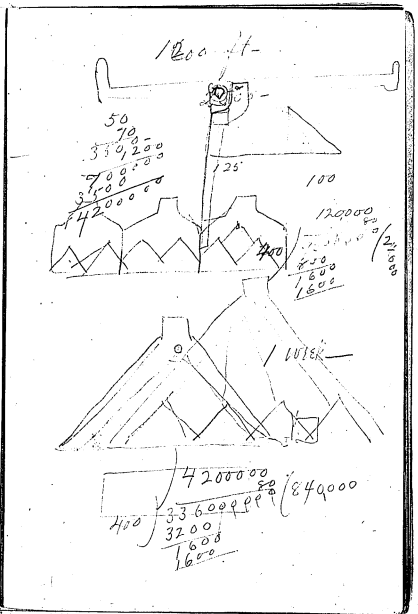
10 Lb -
3 -
3 Lb
2 Lb
20
10 000
500
150 -
125
100
85 -
75 -
60
40 000
20 000
1

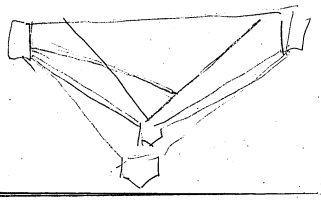
1

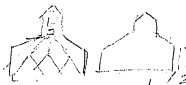



1 hour

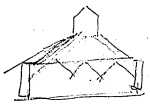



125
100
120000
1600
1600
42000000
3360000
37200
1600
1600
1849000

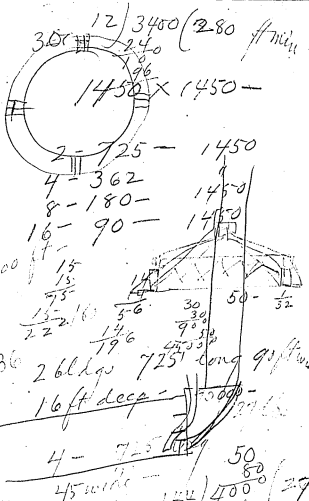


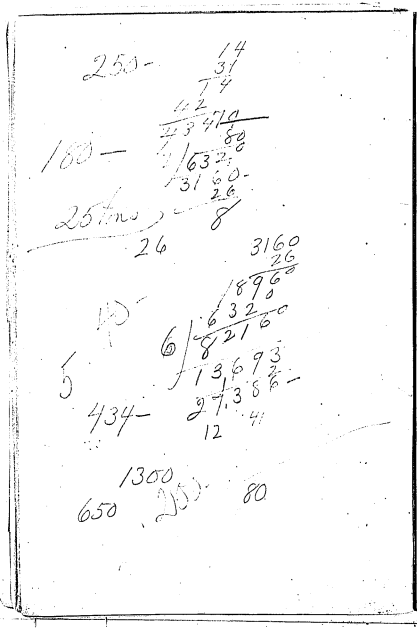


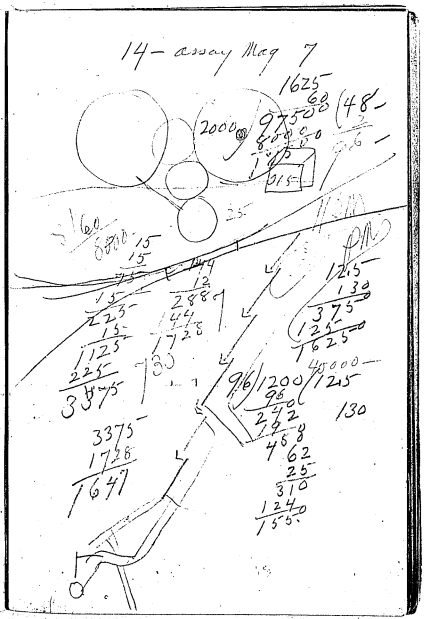
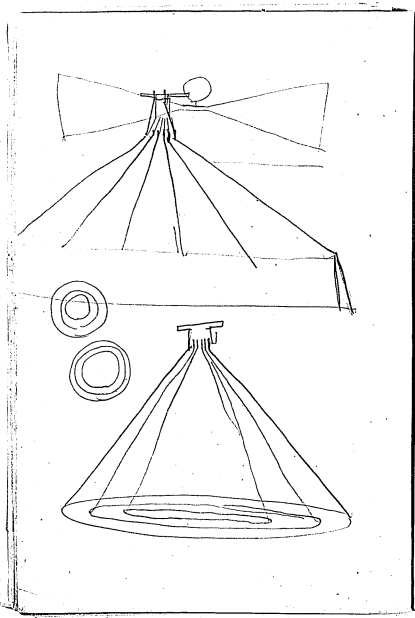
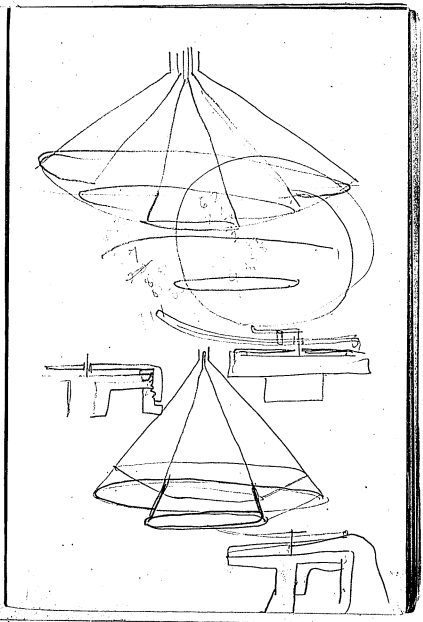
12.000
17
204000
120000
60 / 2040 / 180 (34 per
240
17. 180 lbs 2 Milling stuff.
1



4000000
400
80 / 400 (5-






14 – assay Mag 7